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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/614,407 | 07/12/2000 | Bo Zheng | AMAT/4471/CALB/COPPER/SB | 1903 |

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EXAMINER

SMITH HICKS, ERICA D

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1741

DATE MAILED: 04/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/614,407

Applicant(s)

ZHENG ET AL.

Examiner

Erica Smith-Hicks

Art Unit

1741

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 12 July 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 11-31 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☒ Interview Summary (PTO-413) Paper No(s). 6
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-10, drawn to a method for depositing metal on a plating surface, classified in class 205, subclass 123.
 - II. Claims 11-21, drawn to a computer readable medium, classified in class 341, subclass 3.
 - III. Claims 22-31, drawn to an apparatus that deposits metal on a plating surface, classified in class 204, subclass 224R.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used for a materially different process such as an electrochemical removal process.

3. Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions are incapable of use together as the method of

Group I is not supplied by a computer readable medium and the different inventions have different functions, the function of Group I being a method, and the function of Group II being a product employed in an apparatus.

4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Atty. Keith Tackett on December 14, 2001 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-31 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

8. Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by TAYLOR et al. US 6,203,684 B1.

Claim 1 is rejected because TAYLOR et al. (hereafter TAYLOR) teach a method for depositing metal on a plating surface of an object immersed in an electrolyte solution prior to bulk deposition on the horizontal surface of the plating surface, the method comprising applying a voltage form an anode to the plating surface to enhance the concentration of metal ions in the electrolyte solution that is contained in a feature on the plating surface at col. 2, lines 18-35 of the reference.

Claim 2 is rejected because TAYLOR teach the method wherein during the application of voltage, the plating surface is immersed within the electrolyte solution at col. 2, lines 28-30 of the reference.

Claim 3 is rejected because TAYLOR also disclose the method wherein the application of voltage is sufficient to attract ions to proximate the plating surface at col. 3, lines 50-54.

Claim 4 is rejected because the primary reference to TAYLOR teaches substrate features comprised of trenches, vias or contacts at col. 1, lines 15-17, 45-49.

Claim 5 is rejected because TAYLOR teach the method further comprising applying a current from the anode to the plating surface to deposit metal from the metal ions in the feature, the current is applied prior to the bulk deposition at col. 3, lines 50-63.

Claim 6 is rejected because TAYLOR teach the method wherein the current is applied for a sufficient duration to fill the feature at col. 11, lines 28-30.

Claim 7 is rejected because TAYLOR teach the method wherein the features comprise a wall and a bottom, wherein during the depositing the metal in the features, the deposition rate on the bottom is greater than the deposition on the walls as shown in Figure 3D of the reference and described at col. 9, lines 24-30.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over TAYLOR et al. US 6,203,684 B1 as applied to claims 1-7 above and further in view of TSAI et al. US 6,224,737 B1.

TAYLOR et al. are as applied, argued and disclosed above and incorporated herein.

While TAYLOR et al. disclose a sufficiently applied current time and voltage, they fail to expressly teach current times of less than 5 seconds, nor voltage of 2-10, preferable 5 volts.

TSAI et al. provide these teachings in claim 8 of the reference wherein a biasing voltage of 2.2 is applied for up to 5 seconds.

TAYLOR and TSAI et al. in combination teach all of the limitations of Applicants' claims 8 and 9 and are combinable as they are from the same technology area of biasing voltage for seamless fill of semiconductor micro-features.

It would have been obvious to a person of skill in the art at the time of the invention to have employed processing times and voltage as taught by TSAI et al. in the TAYLOR method because TSAI et al. have shown where these processing parameters would have sufficiently created biasing effect for tailoring the seamless fill of semiconductor features, thus enhancing the overall plating uniformity.

Regarding the limitations of claim 10, while neither reference expressly teaches an applied voltage of 5 volts, the specific voltage would have been considered a result effective variable by one having ordinary skill in the art. As such, one having ordinary skill would have routinely optimized the voltage and the processing times of the biasing

and plating methods to obtain the desired plating benefits attendant therewith. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 105 USPQ 233. Therefore, claim 10 is also rejected as obvious given the teachings of TAYLOR and TSAI et al.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. TAYLOR, US 6210555 B1; 6303014 B1 and 6319384 B1 related continuing patents of the primary reference herein applied.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erica Smith-Hicks whose telephone number is 703/ 305-7645. The examiner can normally be reached Wed.-Fri. from 7:30 a.m.-6:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 703/ 308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703/872-9311 for regular communications and 703/872-9310 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703/ 308-0661.

Erica Smith-Hicks
Examiner
Art Unit 1741

ESH
April 8, 2002



DONALD R. VALENTINE
PRIMARY EXAMINER
GROUP 1400 1741

